



Long-Term Methanol Test Program

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Objective

To determine the effects of neat methanol (M100) fuel on engine performance, engine wear, and exhaust emissions during long-term use.

Approach

Engine wear, gasket performance, fuel economy, exhaust emissions, oil consumption, and overall vehicle performance were monitored over approximately 22,000 miles of vehicle operation. The engine was removed from the vehicle and disassembled, and all bearing and ring



M100 vehicle undergoing emissions testing.

clearances and cam profiles were measured to determine any preexisting wear. All gaskets, seals, bearings, and piston rings were replaced. The cylinder bores were honed, valve and valve seats lapped, and the crankshaft journals polished. Higher flow rate fuel injectors supplied by AC Rochester were installed, and the computer system was calibrated for M100 fuel. Vehicle performance, oil consumption, and emissions baselines were established initially for comparative purposes during the program.

At the completion of the program, after the mileage accumulation phase, the vehicle emissions level, oil consumption, and engine performance were again determined. The engine was removed from the vehicle, disassembled, and engine component wear was determined and compared with the initial condition of the engine.

Accomplishments

Long-term testing of the M100-fueled 1988 Corsica confirmed several reasonably well-understood conditions and disclosed a few anomalies that may warrant further study.

- No off-the-shelf pump that will provide reliable long-term service in M100 is available. Materials incompatibility and the lack of lubricity appear to contribute to fuel pump wear and failure. The lack of lubricity may



have also contributed to the degraded performance of the fuel injectors.

- Cold starting is a severe problem when using M100 below ambient temperatures of 15°C. Cold cranking of the Corsica is thought to have produced cylinder wall scoring and piston scuffing, identified when the engine was disassembled.
- Initial FTP emissions test results were excellent, with all exhaust constituents (except nonmethane organic gas [NMOG]) below ultra-low emission vehicle (ULEV) levels. Emissions at program conclusion increased significantly as a result of the degraded condition of cylinders 3, 4, and 5. Catalyst poisoning caused by increased lubricating oil consumption may also have been a contributing factor.
- Based on the results of this research, M100 is considered to have excellent potential as an alternative fuel. Cold-starting problems and component wear caused by lack of lubricity must be addressed, but M100 has the potential for excellent emissions and, with a properly designed engine, provides outstanding vehicle performance and fuel economy. No fuel or safety handling problems were encountered during the project.

- The initial oil consumption rates measured for the M100-fueled engine are on the upper end of the range typical of gasoline-fueled engines. The wear and damage to the engine significantly affected the increase in oil consumption rate.

Future Direction

Project is complete.

Publications

Maxwell, T. and J. Jones. 1993. "Long-Term Methanol Test Program," in *Proceedings of the Tenth International Symposium on Alcohol Fuels, The Road to Commercialization*, Vol. 1, pp. 73–81, Colorado Springs, CO, November 7–10.

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